

I believe them to belong to the upper beds of the Siwalik series. In connection with the notes which I was enabled to make during the very hasty examination of the ground travelled over, two facts seem to me to be of considerable importance. The first is the reappearance of older strata than Cretaceous, and strata of distinctly a Himalayan type. One of the great problems of Asiatic stratigraphy is the exact connection of the sedimentary rocks of the North-West Himalayas with the system of the Caucasus, which is again only a continuation of the Alpine system; whether or not the Hindoo Koosh may be looked upon as a continuation of our North-West Himalayas can only be decided after an examination of its geotectonic features. The connecting link, so to speak, has yet to be found. But the finding of true Carboniferous marine beds containing *Productus semireticulatus* in a range which belongs to the Hindoo Koosh system is a distinct step towards the solving of the great stratigraphical problem of Central Asia. The second fact is of rather an economic than purely scientific interest. I found at more than one place along the route an altered rock near the contact of the hippuritic limestone and the igneous rocks, which in character resembles exactly the gangue in which at Candahar the gold and other minerals occur. So I believe that a careful search would certainly reveal similar ore-deposits in the Sabzawar and Herat districts. I may here mention again that the contact rocks in the Candahar district contain exactly the same minerals as do the altered hippuritic limestone beds of the Banat in Hungary, which also have been disturbed by young granitic rocks."

The same Correspondent, in a previous letter, describes the journey across Seistan from Khwaja Ali to Lash Jowan. The geological features of this part of Seistan are, according to Mr. Griesbach, extremely simple. Only post-tertiary and recent deposits were met with; the former are fluviatile beds, mostly clays, soft sandstones, and gravels, in character much the same as those forming the tableland of Handesin Tibet, and probably belonging to the same age. The drainage of the area during post-tertiary times seems to have been generally identical with the present one, though, perhaps, of a more extended nature. The recent gravel beds and conglomerates containing worn material from the neighbouring hill ranges are found in the Farah Rud and the Kash Rudak in considerable thickness, capping the underlying clays and sandstones of post-tertiary age. Locally, the conglomerate is replaced by a hard limestone breccia, as for instance at Galichah and also the Helmund. But the general character of this deposit is that of the Indus valley gravels, which are seen to overlie unconformably the younger Siwaliks along the Marri and Bugti hills and the Suliman range. They are found of course within the area of the present drainage. Of useful minerals, only gypsum exists, which is found in the post-tertiary clays, fills fissures and joints, and may perhaps also be found in larger masses. Apparently it is made use of for the manufacture of Gutch or plaster; traces of diggings for it are found near Lash.

#### UNIVERSITY AND EDUCATIONAL INTELLIGENCE

OXFORD.—The following scheme of lectures and classes in Natural Science has been issued by the Faculty for Lent Term, 1885:—

In the Physical Department of the Museum Prof. Clifton continues his course on the Galvanometer and Ohm's Law. Practical instruction in Physics is given by the Professor and by Messrs. Walker and Selby. Mr. Walker lectures on the Theory of Errors, and Mr. Selby, on Elementary Mechanics. At Christchurch Mr. Baynes lectures on Electrodynamics, and has a class for practical instruction in Electrical Measurements. At Balliol Mr. Dixon lectures on Elementary Magnetism and Electricity.

In the Chemical Department of the Museum Dr. Odling continues his course on the Adipic Compounds. Mr. Fisher lectures on Inorganic, and Dr. Watts on Organic, Chemistry. At Christchurch Mr. Harcourt lectures on the Non-Metallic Elements, and at University Mr. Veley lectures on Physical Chemistry.

In the Morphological Department of the Museum Prof. Moseley continues his course on the Comparative Anatomy of the Invertebrata. After each lecture special instruction is given in illustration of the lecture. Dr. Hickson lectures on Animal Morphology, Mr. Barclay-Thompson on the Anatomy of Mammalia, Mr. Hatchett Jackson on the Principles of Comparative Embryology and Development, and Mr. Poulton on the Distribution of Animals.

In the Physiological Department of the Museum Prof. Burdon-Sanderson lectures on the Nervous System, and practical instruction is given by the Professor and Messrs. Dixey and Gotch.

In the Botanic Garden Prof. Bayley Balfour lectures on Elementary Morphology and Physiology, and on the Morphology of the Vascular Cryptogams. Prof. Gilbert lectures on the Result of Field Experiments.

Dr. Tylor lectures on the Early History of Arts and Sciences; Prof. Maskelyne on the Rectangular-axed Crystal Systems; Prof. Prestwich on the Palæozoic and Mesozoic Series.

It is rumoured that the grant to carry on the new physiological laboratory under Prof. Burdon-Sanderson will be opposed in Convocation by the anti-vivisectionists. If this should turn out to be true, it behoves all members of Convocation who side with the advancement of science to come up and record their votes.

CAMBRIDGE.—The Board for Physics and Chemistry announces the following lectures for this term:—

Chemistry: Prof. Liveing, General Course; Prof. Dewar, Organic Chemistry; Mr. Main, St. John's, General Course; Mr. Pattison Muir, Caius, General Principles, advanced, especially Physical Chemistry; and Elementary Course for 1st M.B.; Mr. Scott (Prof. Dewar's assistant) Elementary Organic Chemistry; Mr. Heycock, King's, Chemical Philosophy for Tripos, Part I.; Practical Chemistry, Mr. Sell and Mr. Fenton, three courses of demonstrations, for medical students, Tripos Part I. and Tripos Part II.; Mr. Robinson, Chemistry as applied to Agriculture; Sidney College Laboratory, Demonstrations for 1st M.B., with explanatory lectures.

Physics: Prof. Stokes, Hydrodynamics; Prof. Thomson, Magnetism; Mr. Atkinson, Trinity Hall, Heat and Hydrostatics; Mr. Glazebrook and Mr. Shaw, Elementary and Advanced Physics; Mr. Hart, St. John's, Light and Electricity, elementary and advanced; Practical Physics, Demonstrations in Cavendish Laboratory, three courses.

Mineralogy: Prof. Lewis, Lectures and Demonstrations.

Mechanism: Prof. Stuart, Mechanism and Applied Mechanics, and Theory of Structures; Mr. Lyon, Elementary Mathematics, and Statics and Dynamics.

The Board for Biology and Geology publish the following list of lectures:—

Geology: Prof. Hughes, Pleistocene, with special reference to Prehistoric Archaeology; Dr. R. D. Roberts, Physiography, and Class Work; Mr. Marr, Geological Evolution; Mr. T. Roberts, Palæontology; Mr. Teall, Advanced Petrology; Mr. Harker, Elementary Petrology and Class Work; Prof. Hughes, Field Lectures.

Botany: Dr. Vines, General Elementary Course, with practical work; Mr. Gardiner, Anatomy of Plants, advanced, with practical work; Dr. F. Darwin, General Biology of Plants; Mr. J. W. Hicks Sidney, Elementary Course; Mr. Potter, Classification of Gymnosperms and Monocotyledons.

Elementary Biology: Dr. Vines and Mr. Sedgwick.

Zoology: Prof. Newton, Geographical Distribution of Vertebrata; Mr. Weldon, Practical Morphology, Invertebrata; Mr. Sedgwick, Anatomy and Embryology of Vertebrata, elementary; Mr. Harmer, Osteology of Vertebrata, and advanced course on Arthropoda; Mr. Gadon, Palæontology and Affinities of Groups of Mammalia.

Physiology: Prof. Foster, Elementary Course; Mr. Lea, Chemical Physiology; Mr. Langley, Advanced Course; Dr. Gaskell, Circulation and Respiration, advanced; Mr. Hill, Class for 2nd M.B.

Human Anatomy: Prof. Macalister, Organs of Circulation and Respiration; Demonstrations in Osteology.

The Board for Mathematics announces the following lectures on higher mathematics this term:—Prof. Stokes, Hydrodynamics; Prof. Adams, Lunar Theory; Prof. Thomson, Trinity College, Electromagnetism; Mr. Hobson, Christ's, Planetary Theory; Mr. Glazebrook, Theory of Light; Mr. Forsyth, Functions of Complex Variables; Dr. Pesant, Analysis, Definite Integrals, Calculus of Variations and Differential Equations; Mr. Mollison, Fourier's Series and Conduction of Heat; Mr. Pendlebury, Analytical Optics; Dr. Routh, Attractions and the Figure of the Earth; Mr. Stearn, Electrostatics.

Mr. G. J. Romanes, LL.D., F.R.S., has been appointed to deliver the Rede Lecture this year.

R. E. Fry, Clifton College, has been elected to a Natural Science Open Exhibition at King's; W. J. Elliott, Newcastle

School, Staffs., and A. E. Potter, Yorkshire College of Science, to Entrance Scholarships at Christ's College; H. Bury, third year, and F. W. Oliver, second year, to Foundation Scholarships at Trinity College.

S. F. Dufton, Grammar School, Bradford, has been elected to an Open Exhibition for Natural Science at Trinity College, and A. E. Mayeur, St. Paul's, to an additional Exhibition.

### SCIENTIFIC SERIALS

*Journal of the Franklin Institute*, 708, December, 1884.—G. Forbes, dynamo-electric machinery; a full report of the lecture given by Prof. Forbes at the Philadelphia Exhibition.—R. H. Thurston, steam boilers as magazines of explosive energy. This paper contains lengthy numerical tables of the energy, expressed both in foot-pounds and in kilogrammetres, stored up in boilers containing given weight of water or steam at given pressures. According to these calculations a Lancashire two-flue boiler holding three tons of water working at 37 lbs. of steam pressure would, by its explosion, liberate sufficient energy to blow itself nearly 2½ miles high, with an initial velocity of 900 feet per second.—E. J. Houston, glimpses of the International Electrical Exhibition, Nos. 2 and 3. These papers give accounts of Dolbear's electrostatic system of telephony, and of Gray's telephonic inventions, with numerous illustrations.—L. d'Auria, the earth's ellipticity; a reply to Prof. Chace.—Standard sizes of belt heads and nuts, a reply by Mr. Coleman Sellers to Mr. Simmonds.

### SOCIETIES AND ACADEMIES

#### LONDON

**Royal Society**, Nov. 27, 1884.—“Notes on the Microscopic Structure of some Rocks from the Andes of Ecuador, collected by E. Whymper. No. V. (conclusion). Altar, Illiniza, Sincholagua, Cotocachi, Sara-urcu, &c.” By Prof. T. G. Bonney, D.Sc., F.R.S.

The microscopic structure of rocks from the first four of these mountains was described, the specimens being less numerous than in some of the former cases. Altar, Sincholagua, and Cotocachi furnished augite-andesites, mostly hypersthéniferous; Illiniza, micaceous and hornbléndic augite-andesites. Sara-urcu was not a volcanic mountain, the specimens all being metamorphic rocks, varieties of gneiss and schists, similar to those which occur among the less ancient metamorphic rocks of the Alps and the Scotch Highlands; hence, probably, Archæan, but not the very oldest Archæan. A few miscellaneous specimens were also described, and the paper concluded with some general remarks and a summary of results.

January 15.—“On the Chemical Composition of the Cartilage occurring in certain Invertebrate Animals.” By W. D. Halliburton, M.D., B.Sc. (Lond.), Sharpey Physiological Scholar, University College, London. Communicated by Prof. E. A. Schäfer, F.R.S. (from the Physiological Laboratory, University College, London).

At Prof. Lankester's suggestion I have submitted to chemical analysis the cartilages occurring in *Sepia* and in *Limulus*.

The basis of the cartilage is a chondrin-like body which gives the reactions of mucin and gelatin (indeed, chondrin, as it occurs in the ordinary hyaline cartilage of Vertebrates, is now regarded by many as a mechanical mixture of these two bodies). But in the cartilages of the two Invertebrates in question the gelatinous element is exceedingly small, and no gelatinisation occurs on the cooling of the hot watery extract.

In addition to this, however, the cartilage of both these animals differs from that of Vertebrates in containing a certain small percentage of chitin. In the case of *Limulus* 1·01 per cent., and of *Sepia* 1·22 per cent., of chitin, in the dry state is present.

I have also demonstrated that chitin exists in the liver of the king crab, though whether in the connective tissue or in the liver cells themselves I cannot say. (The connective tissue element is very abundant in the liver of this animal, and it seems probable, looking at the part that chitin plays as a supporting structure in these animals, that it really forms in this instance a partial basis for the connective tissue.)

The way in which chitin was demonstrated to exist was the same in all three cases, viz. :—

(1) After digesting with potash, a residue insoluble in boiling alkalis remains behind.

(2) This residue, which, when washed and dried, is obtainable in a white amorphous condition, is insoluble in weak-acids; but in concentrated mineral acids it is soluble in the cold.

(3) On boiling the solution in sulphuric acid, a body which has the power of reducing cupric salts is formed.

(4) On boiling the solution in hydrochloric acid it turns brown, and on evaporating this solution to dryness a body crystallises out which has all the properties of hydrochlorate of glycosamine.

(I prepared some of this body from the chitin contained in the exoskeleton of cockroaches, and also obtained from Prof. Lankester some crystals of the same body which Prof. Gamgee had kindly sent him.)

I was (thus) enabled to compare the crystalline body I had obtained from the invertebrate cartilage with that of the pure hydrochlorate of glycosamine, and they were found to agree in the following points :—

(a) Crystalline form: rhombic prisms of the monoclinic system; measurement of the angles gave the same result in all cases.

(b) Action of polarised light: *nil*.

(c) Solubilities: easily soluble in water, soluble with difficulty in alcohol.

These results are especially interesting as showing that chitin is not a body which is exclusively epiblastic in origin, but in these three instances at least occurs in mesoblastic structures.

**Mathematical Society**, January 8.—J. W. L. Glaisher, F.R.S., President, in the chair.—Messrs. F. R. Barrell, S. O. Roberts, and Prof. M. N. Dutt, St. Stephen's College, Delhi, were elected members. The Rev. T. C. Simmons was admitted into the Society.—Prof. M. J. M. Hill read a paper on the differential equations of cylindrical and annular vortices.—The Rev. R. Harley, F.R.S., spoke on criticoids.—The following further communications were made:—Multiplication of symmetric functions, by Capt. Macmahon, R.A.—Note on symmetrical determinants, by A. Buchheim.—Results in elliptic functions, by the President (J. J. Walker, F.R.S., Vice-President, in the chair).—Mr. Tucker read a second note by Prof. Gayley, F.R.S., on the binomial equation  $x^p - 1 = 0$ : quinquisection, and communicated a second paper, by H. MacColl, on the limits of multiple integrals.

**Victoria Institute**, January 19.—A paper on the historical evidences of the Abrahamic migration was read by Mr. W. Boscarven, in which he gave extracts from the new translations of some tablets which had been discovered by Mr. Rassam during his last visit to the East. These extracts contained a large number of names of persons and cities mentioned in the Bible record of the times to which they referred.

#### EDINBURGH

**Royal Society**, January 5.—L. Sang, LL.D., Vice-President, in the chair.—Mr. Harvey Gibson submitted a paper on the anatomy of *Patella vulgata*.—Mr. W. W. J. Nicol read a paper on a theory of solution. Solution of a salt in a liquid results from the attraction of the molecules of the liquid for a molecule of the salt exceeding the attraction of the molecules of salt for one another. Saturation ensues when these attractions are balanced. The theory explains variation of solubility with rise of temperature. Mr. Nicol brought forward experimental evidence in support of his views.—Mr. H. R. Mill, chemist to the Granton Marine Station, read a paper on the salinity of the water of the Firth of Forth. Results were given, showing the variation of salinity along the Firth for high and low water.

#### PARIS

**Academy of Sciences**, January 12.—M. Bouley, President, in the chair.—Thermo chemical experiments with phosphorus fluoride, a new gas recently discovered by M. Moissan, by M. Berthelot.—Anatomical description of *Ganidia Garnotii*, Payrandeau, a species of *Ganidia* very abundant on the coast of Algeria, by M. de Lacaze-Duthiers.—Report on M. Luvin's two memoirs dealing with the formation of hailstones and the development of electricity during thunderstorms, by the Commissioners, MM. Becquerel and Faye.—On the formation of toxic alkaloids in cholera patients, by M. A. Villiers. Experiments made on two victims of cholera soon after death enabled the author to determine the presence of an alkaloid clearly characterised by its alkaline and chemical reactions. It is found chiefly in the intestine, and also in small quantities